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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/045,318	11/09/2001	Stephen P. DeOrnellas	TEGL-01082US3	3120

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 06/04/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

AS

Office Action Summary	Application No.	Applicant(s)	
	10/045,318	DEORNELLAS ET AL.	
	Examiner	Art Unit	
	Lynette T. Umez-Eronini	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 29 February 2004.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,42,45-50,53 and 57 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,42,45-50,53 and 57 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required:

In claim 53, lines 3-5, "wherein the hard mask remains substantially unexposed to a gas for lowering at least one of its sputtering yield or erosion rate" and

In claim 53, lines 6-8, "allowing the patterned hard mask to react with the etch process gases mixed together in order to lower at least one of the sputtering yield and erosion rate of the hard mask and to etch the layer corresponding to the pattern of the hard mask" are not supported by the specification, which fails to disclose the process gases.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 53 and 57 are rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

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In claim 53, lines 3-5, "and wherein the hard mask remains substantially unexposed to a gas for lowering at least one of its sputtering yield or erosion rate" is not supported by the specification.

In claim 53, lines 6-8, "allowing the patterned hard mask to react with the etch process gases mixed together in order to lower at least one of the sputtering yield and erosion rate of the hard mask and to etch the layer corresponding to the pattern of the hard mask" remains substantially unexposed to a gas for lowering at least one of its sputtering yield or erosion rate" is not supported by the specification.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 53 and 57 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 53, lines 6, "allowing the patterned hard mask to react with the etch process gases mixed together" is indefinite because it is unclear whether "the etch process gases" comprise one gas or more than one gas.

In claim 57, lines 1-2, "wherein the etch process gases comprise a gas . . . comprising one of oxygen, nitrogen, fluorine, boron, and carbon gas" is indefinite because it is unclear whether "the etch process gases" comprise one gas or more than one gas.

Claim Rejections - 35 USC § 102/103

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

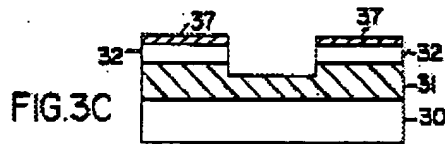
8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1, 42, 45-50, 53 and 57 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Fujii et al. (US 5,170,231).

Fujii teaches, "Then, the entire surface of the p-SiC single-crystal layer **32** was covered with an aluminum film **37** by vacuum deposition, followed by patterning with the

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use of photolithography. Using the patterned aluminum film (same as applicants' hard mask comprising a reactive metal and being substantially unoxidized) **37** as a mask, a predetermined portion of the p-SiC single-crystal layer **32** and n-SiC single-crystal layer **31** was etched down to the depth of about 5 μm by a reactive etching technique, as shown in FIG. 3C. As the etching gases, tetrafluoromethane (CF_4) and oxygen (O_2) were used" (column 9, lines 40-49).



The above reads on,

A method for etching a pattern on a workpiece, comprising:

selecting a workpiece with a hard mask deposited over a layer to be etched, which hard mask is comprised of a reactive metal, the hard mask further defining a pattern exposing portions of the layer to be etched, said hard mask being substantially unoxidized; and

processing the workpiece in a reactor by exposing the entire hard mask to oxidizing gas mixed with an etchant in order to expose the hard mask to the oxidizing gas and form an oxide skin on the exposed surface of the hard mask, and in order to etch the layer corresponding to the pattern of the hared mask.

Although it appears Fujii teaches the limitations of the claimed invention, Fugii differs in failing to disclose including at least one portion having a critical dimension

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and whereby growth of the layer during the etch is minimized in the portion of the layer corresponding to the critical dimension.

Since Fugii's method of forming the same unoxidized hard mask and etching the mask and a layer underlying layer the mask layer with the same oxidizing gas and with an etchant, are the same as the method claimed by applicants, then using Fugii's method in the same manner as the claimed invention would obviously result in including at least one portion having a critical dimension and whereby growth of the layer during the etch is minimized in the portion of the layer corresponding to the critical dimension, **in claim 1**.

The above aforementioned further reads on,

said selecting step includes selecting a workpiece having a hard mask, which hard mask comprises of one of titanium, aluminum, and tantalum, **in claim 42**;

wherein the oxidizing gas comprises one of oxygen, nitrogen, fluorine, boron, and carbon gas, and any combination of oxygen, nitrogen, fluorine, boron, and carbon gas in the reactor prior to or during said etch step, **in claim 45**;

said selecting step includes selecting a workpiece with a lithographic layer covering the hard mask, **in claim 46**;

said selecting step includes selecting a hard mask, which is readily oxidizable, **in claim 47**;

said selecting step includes selecting a substrate with a hard mask, which hard mask is comprised of a metal with a low sputtering yield, **in claim 48**.

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oxidizing the hard mask oxidizes the surface of the hard mask, thereby slowing down an etch rate of the hard mask, **in claim 49**; and

said selecting step includes selecting a hard mask (1) on which has been or (2) on which can be developed at least one of an oxide, nitride fluoride, boride and carbide (column 2, line 53 – column 3, line 20), **in claim 50**.

The said above also reads on,

processing the workpiece using process gases, the workpiece having a hard mask deposited over a layer to be etched, which hard mask is comprised of a reactive metal and defines a pattern wherein a portion of the layer is exposed, and wherein the hard mask remains substantially unexposed to a gas for lowering at least one of its sputtering yield rate; and

allowing the patterned hard mask to react with the etch process gases mixed together in order to lower at least one of the sputtering yield and erosion rate of the hard mask and to etch corresponding to the pattern of the hard mask, **in claim 53** and

wherein the etch process gases comprise a gas for lowering the erosion rate of the hard mask comprising one of oxygen, nitrogen, fluorine, boron, and carbon gas, **in claim 57**.

Response to Arguments

10. Applicants' arguments with respect to claims 1 and 42-56 see Remarks on pages 5-6 of amendment filed 5/9/2004, have been considered but are moot in view of the new ground(s) of rejection. Applicants' newly amended claims, which contain limitations that are directed at the hard mask remaining substantially unoxidized during etching, are not disclosed by the formerly applied reference of Nulman et al. (US 4,496,419).

Conclusion

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 571-272-1470. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571-272-1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306. .

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ltue

May 20, 2004

NADINE G. NORTON
SUPERVISORY PATENT EXAMINER
